สภาพและความต้องการพัฒนาห้องเรียนกลับด้านบนคลาวด์โดยใช้การเรียนแบบปัญหาเป็นฐานในสังคม พหุวัฒนธรรมเพื่อส่งเสริมการคิดอย่างมีวิจารณญาณ [1]

Assessment of the Current State and Needs Related to Development of a Cloud-based Flipped Classroom Using Problem-based Learning in a Multicultural Society to Enhance Critical Thinking

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาสภาพและความต้องการในการพัฒนาห้องเรียนกลับด้านบนคลาวด์โดยใช้การเรียนแบบปัญหาเป็นฐานในสังคมพหุวัฒนธรรมเพื่อส่งเสริมการคิดอย่างมีวิจารณญาณ โดยใช้แบบสอบถาม กลุ่มตัวอย่างที่ใช้ในการวิจัย คือ นิสิตนักศึกษาระดับปริญญาตรี สถาบันอุดมศึกษาของรัฐ ในภาคกลางและภาคใต้ จำนวน 445 คน สุ่มตัวอย่างด้วยเทคนิควิธีการแบบก้อนหิมะ ใช้วิธีวิจัยเชิงปริมาณ เครื่องมือที่ใช้ในการวิจัย คือ แบบสอบถาม ผลการวิจัยพบว่า นิสิตนักศึกษาระดับปริญญาตรีส่วนใหญ่มีระดับความรู้และทักษะในการใช้งานเทคโนโลยีสารสนเทศในระดับปานกลาง มีการเข้าถึงอินเทอร์เน็ตด้วยการเชื่อมต่อผ่านอุปกรณ์สมาร์ตโฟนมากที่สุด มีความต้องการพัฒนาห้องเรียนกลับด้านบนคลาวด์ ได้แก่ การวัดผลการเรียนรู้ก่อนและหลังเรียน ผู้สอนที่เอาใจใส่ ให้คำชมเชยและเสริมแรงในการเรียน การเน้นกิจกรรมการเรียนรู้ที่เริ่มต้นโดยปัญหาเพื่อให้ผู้เรียนได้วิเคราะห์และแก้ไขปัญหาจากการลงมือทำ การมีความสัมพันธ์ทางวัฒนธรรมเชิงบวกและเข้าใจผู้เรียนที่มีความต่างทางวัฒนธรรม รวมทั้งการจัดสภาพแวดล้อมการเรียนรู้เอื้อต่อการทำงานร่วมกันบนระบบคลาวด์โดยใช้แอปพลิเคชันเครือข่ายสังคมที่สามารถเข้าถึงแหล่งการเรียนรู้ได้ทุกที่ทุกเวลา

Abstract

The purpose of this research was to examine the state and needs related to the development of cloud-based flipped classroom using problem-based learning in a multicultural society to enhance critical thinking. Using a questionnaire to collect information from 445 undergraduate students in universities in the Central and Southern regions of Thailand, and employing Snowball Sampling to select samples, using quantitative research methods. The results showed that the majority of the students who responded have moderate knowledge and skill in information and communications technology, and access to the internet via a smart phone. The results of the research into the state and needs reveal that the students require pre-test and post-test assessment. Additionally, their teachers to pay attention to them and provide reinforcement in class, as well as accommodation of cultural diversity among class members. In terms of learning activities, problem-based learning, which gives opportunities to students to analyses and find solutions through practice, is a preferred method. The learning context supports cloud based collaborative work and uses social network applications in learning activities, allowing the class to develop positive cultural relationships that involve learning and understanding about cultural differences among students. Furthermore, students can access learning resources anywhere, and anytime.

คำสำคัญ: ห้องเรียนกลับด้านบนคลาวด์ การเรียนแบบปัญหาเป็นฐาน สังคมพหุวัฒนธรรม การคิดอย่างมีวิจารณญาณ นักศึกษาระดับปริญญาตรี

Keywords: Cloud-based flipped classroom, Problem-based learning, Multicultural society, Critical thinking, Undergraduate students

Introduction

Critical thinking is a fundamental skill which leads to creative thinking. The skill is essential for developing innovations aimed at driving the Thailand 4.0 era. Critical thinking is a metacognitive process through purposeful and contemplative decision making which contributes to more opportunities for drawing reasonable conclusions, leading to sensible arguments or problem-solving methods. Critical thinking is vital for individual adaptation, flexibility and being well-prepared for rapidly developing opportunities (Dwyer, Hogan, & Stewart, 2014). Moreover, according to the report of The Future of Jobs by World Economic Forum, which ranks the 10 most necessary skills of the labour force from the years 2015 to 2020, critical thinking ranked on fourth in 2015, rising to second place by 2020. This shows that, in the present and future, labour markets need individuals with critical thinking skill as a priority qualification (World Economic Forum, 2016).

Thailand is a culturally diverse country in which different groups of people with different languages, cultures, religions, traditions, values, beliefs, and attitudes learn, adapt and live together peacefully. Moreover, Thai people sustainably preserve their original identities of race and ethnicity. Research from The National Statistical Office of Thailand about Thai people's behavioral, values, cultures, and family relationships in 2014 show that most of the population in all regions -- more than 95% -- is Buddhist, except in the Southern region, where 75.3% of the population is Buddhist and 24.5% is Muslim, representing significantly different figures than other regions (The National Statistical Office of Thailand, 2015). Statistics about the migration of Thai people collected in 2016 show that the highest migration rates are in the Central and Southern regions, which are equal at 1.5%. This implies that the Central and Southern regions are the most culturally diverse societies in Thailand. Therefore, multicultural education is very important for education management faced with cultural differences regarding races, languages, religions, and traditions. A great benefit of multicultural education is that it develops an understanding of cultural differences, positive cultural relationships, less bias, and greater unity, leading to harmony and educational equality (Mitchell & Salsbury, 1999; Nantarat Kongkapet, 2012).

Problem-based learning (or PBL) is a learning management pattern which encourages students to self-develop knowledge by integrating new knowledge and experiences with existing knowledge. According to Constructivist theory, PBL is one key learning activity that strengthens students' thinking skill. PBL offers an important learning strategy that requires teachers and students to take time in class to create a learning experience. Students gain opportunities and freedom of thought while teachers provide valuable advice. Therefore, the flipped classroom is one of the techniques that is suitable for PBL learning.

The concept of a flipped classroom is an educational innovation corresponding to the Thailand 4.0 framework and students' learning skills in the 21st century. In this learning method,

students develop self-learning through videos out-of-class and do extra learning activities to improve understanding during regular classroom sessions. The flipped classroom is one of the integrative learning methods combining online learning and face to face learning activities, both of which aim to provide extended learning for students and develop more understanding (Reidsema, Hadgraft, & Kavanagh, 2017). Students can manage their own learning and do collaborative tasks in class, while teachers provide assistance and facilitate learning activities for students who need individualized attention. The flipped classroom focuses on students' self-development through acquiring new knowledge and experiences together with students' existing knowledge (Vicharn Panich, 2014).

The concept of a cloud-based flipped classroom involves the integration of cloud-based technology and the flipped classroom concept. Based on literature review, cloud-based technology has, to date, only been used for online learning or out-of-class activities. However, cloud-based technology can be beneficial for supporting and facilitating in-class and out-of-class learning activities equally effectively while also promoting communication and teamwork, as well as developing advanced thinking skills. Therefore, the researchers recommend the integration of cloud-based technology with flipped classroom learning activities.

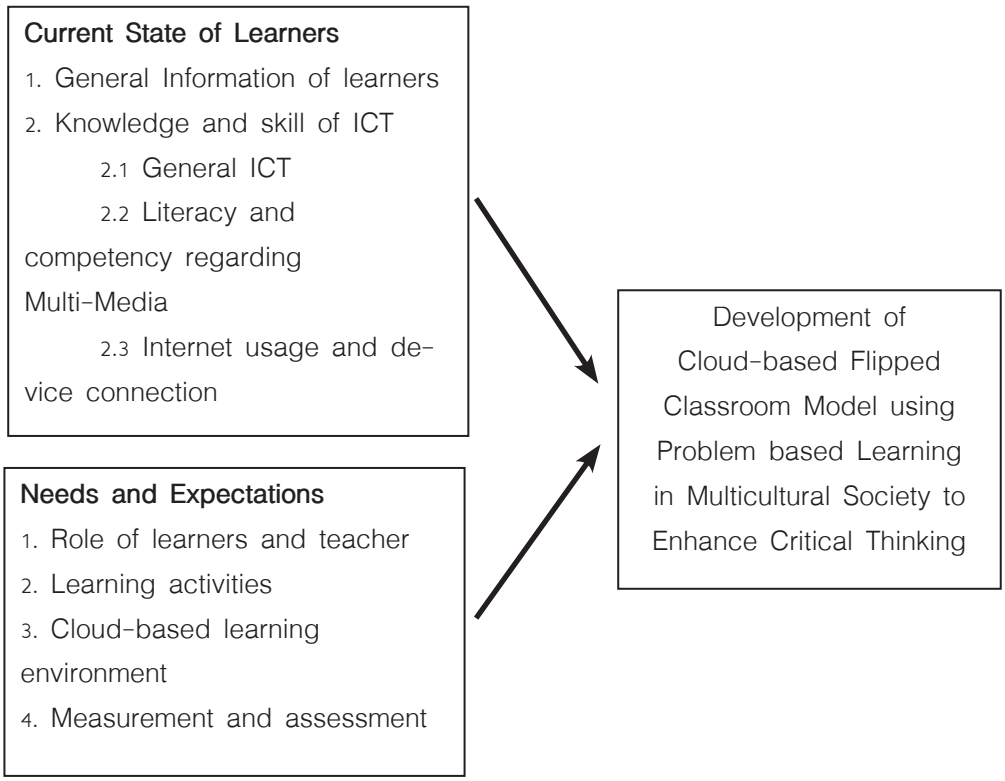
The researchers are interested in investigating the current state and needs of the development of flipped classroom using problem-based learning in a multicultural society to enhance critical thinking of university students in the Central and Southern regions, where cultural diversity in religion and domiciles are found. The researchers hope that the results of this study will be useful for further study into the development of critical thinking in multicultural society through application of technologies to effectively enhance educational learning quality.

Research Objectives

1. To investigate the knowledge and skill of information and communication technologies (ICT) of undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand.

2. To assess the actual state and the expectations of the development of flipped classroom using problem-based learning in a multicultural society to enhance critical thinking of undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand.

Conceptual Framework



Research Methodology

This project involves survey research using a questionnaire. The population comprises undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand. The sample size, representing the entire population, was calculated using Krejcie & Morgan's sample size determination table at 95% confidence and 5% tolerance of 386 samples. The researchers were able to collect 445 samples from 10 universities for this study and used simple random sampling via snowball sampling to select samples to consist of Chulalongkorn University, Srinakharinwirot University, Dhonburi Rajabhat University, King Mongkut's University of Technology Thonburi, King Mongkut's Institute of Technology Ladkrabang, Nakhon Sawan Rajabhat University, Walailak University, Prince of Songkla University, Rajamangala University of Technology Srivijaya and Nakhon Si Thammarat Rajabhat University

The instrument in this research was a questionnaire about the state and needs of the development of flipped classrooms using problem-based learning in a multicultural society to enhance critical thinking. The research underwent content validity by 5 experts, and validity

checking using Cronbach's Alpha Coefficient. The validity of the whole questionnaire of 37 items is 0.97. The questionnaire consists of 3 parts.

Part 1 – The general information of respondents: This part comprises some personal details and a check-list of personal information such as gender, academic year, academic field, university, religion and domicile. This part consists of 6 questions.

Part 2 – The knowledge and skill of information and communication technologies (ICT): This part is a check-list of information about literacy and competency in general ICT knowledge and skills and technical ICT knowledge and skill regarding multi-media (Graphic design, Web design, 2D&3D animation and digital video production), including Internet usage and Internet connection devices. The second part consists of 9 questions.

Part 3 – The assessment of the actual state and the expectations of the development of flipped classroom using problem-based learning in a multicultural society to enhance critical thinking: This part comprises a set of 5-scale rating questions about the actual state and desirable condition in 4 areas, including students and teachers, learning activities, cloud-based learning context, and measurement and assessment. This part consists of 22 questions.

The researchers used quantitative data collection methods. The online survey of a sample of 445 people, which is undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand. Analyse samples using basic statistics include the frequency, percentage, and applied a modified Priority Needs Index in this study. The formula in this analysis is $PNI_{modified}$ = (I-D)/D (Suwimon Wongwanich, 2015).

Research Findings

The general information from 445 undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand, most of them are female (65.5%), studying in the second year (60.4%) in the field of Humanities and Social Sciences (84%). Most of the students are from Chulalongkorn University (48.1%), followed by King Mongkut's Institute of Technology Ladkrabang (13.9%) and Nakhon Sawan Rajabhat University (7.9%) respectively. Most of them are Buddhist (89.9%) and Muslim (6.3%) respectively. The respondents' domiciles are mostly in the Central region (44.9%), Southern region (26.3%) and North-eastern region (15.3%) of Thailand respectively.

The survey of the knowledge and skill of information and communication technologies (ICT) of the undergraduate students consists of two areas: The knowledge and skill of ICT and the literacy and competency in technical ICT knowledge and skill regarding multi-media. The result as follows:

1. The knowledge and skill of ICT based on the questions regarding the literacy

and competency in general ICT knowledge and skill, it was found that the majority of the respondents, or 71.9%, have moderate literacy and competency in ICT knowledge and skill. Therefore, they are able to use technologies for communication and learning, such as searching information and learning from online resources. An additional 26.3% of the respondents possess high competency. It could be interpreted that they are able to use ICT for communication, learning, creating and sharing, or broadcasting information, such as creating and producing online learning media and developing programs or websites for learning purposes. Only 1.8% of the respondents reported having low competency. They are able to use ICT for communication only, such as Line, chat, e-mail and video call.

2. The literacy and competency in technical ICT knowledge and skill regarding multi-media that the researchers collected data about the competencies of graphic designing programs such as Photoshop, Illustrator, and Indesign; web designing programs such as Dreamweaver, Wordpress, Joomla, Appserv, and Filezilla; 2D and 3D animation programs such as 3D Studio MAX, Maya, Cinema4D, SketchUp, and Lightwave 3D; and digital video production programs such as Adobe Premiere, Adobe Photoshop, andAfter Effect. The results show that the highest skill level among the respondents relates to competency in using graphic designing programs, totaling of 39%, followed by the competency in the use of digital video production programs, totaling of 35%. Competency in the use of web design programs accounts for 17% of the result. The least cited skill is the competency to use 2D and 3D animation programs, totaling just 9%. The result is shown in figure 1.

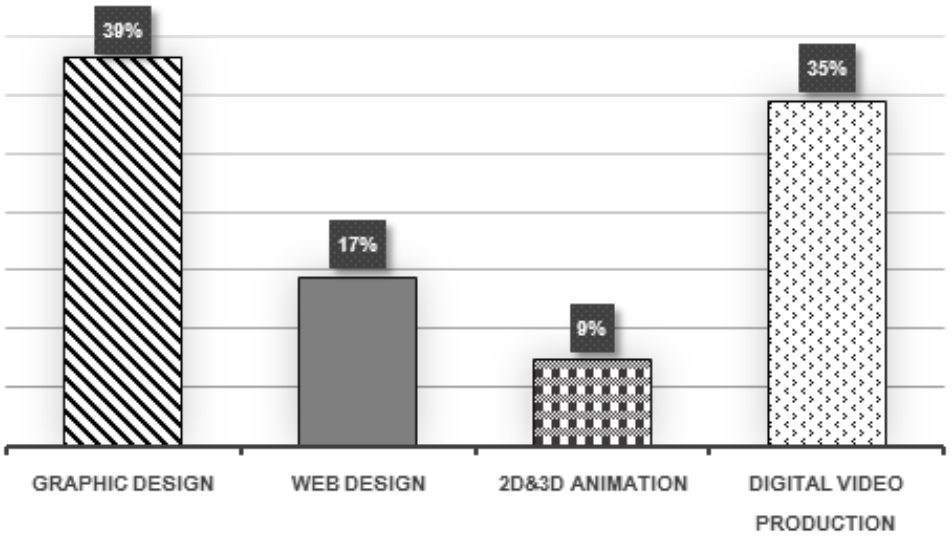


Figure 1 The knowledge and skills in the use of multi-media ICT

The assessment of the actual state and the expectations of the development of flipped classroom using problem-based learning in a multicultural society to enhance critical thinking of undergraduate students is studied 4 aspects, which are students and teachers, learning activities, cloud-based learning context, and measurement and assessment. The highest cited priority need regarding students and teachers is that teachers perform pre-test assessment ($PNI_{modified}$ =0.21). The second priority is that teachers pay attention to students, including showing appreciation and offering reinforcement to students ($PNI_{modified}$ =0.17). The third most important is that classes be grouped informally ($PNI_{modified}$ =0.14). The fourth rated need is that teachers perform post-test assessment ($PNI_{modified}$ =0.10). The fifth is that class members be culturally diverse ($PNI_{modified}$ =0.06).

The highest cited priority need regarding learning activities is that learning activities aim to involve all students in problem-solving by integrating students' existing experiences ($PNI_{modified}$ =0.21). The second highest rated need is that learning activities start from problem-based learning and lead to problem solving actions ($PNI_{modified}$ =0.19). The third priority is that learning activities develop positive cultural relationships ($PNI_{modified}$ =0.18). The fourth rated need is that learning activities focus on learning by doing, and learning activities focused on respect and understanding of students' cultural differences ($PNI_{modified}$ =0.16). The fifth priority is that learning activities focus on rationalization considering rules and regulations, and making decision based on reliable resources ($PNI_{modified}$ =0.13).

The highest cited priority need regarding cloud-based learning context is the ability to do collaborative work via the cloud ($PNI_{modified}$ =0.14). The second rated need is that social network applications are used in learning activities ($PNI_{modified}$ =0.11). The third priority is the ability to access online learning resources anywhere and anytime via electronic devices ($PNI_{modified}$ =0.10). The fourth is that technology is applied in learning activities, and technology is used in communication between students and teachers, as well as among students ($PNI_{modified}$ =0.08).

The highest cited priority need regarding measurement and assessment is that learning assessment is conducted weekly ($PNI_{modified}$ =0.22). The second highest priority for respondents is that students are involved in assessment ($PNI_{modified}$ =0.20). The third rated need is that assignments are relevant to lesson content, and teachers perform practical assessments ($PNI_{modified}$ =0.13). The fourth and lowest rated need is for teachers to perform theory assessment ($PNI_{modified}$ =0.07).

Table 1 The actual state and expectations for the development of flipped classroom using PBL

Items (n=445)	I	D	I-D	(I-D)/D	Order
1. Students and teachers	3.94	3.49	0.45	0.13	3
1.1 teachers perform pre-test assessment	3.86	3.19	0.67	0.21	2
1.2 teachers perform post-test assessment	3.93	3.57	0.36	0.10	11
1.3 classes be grouped informally	3.86	3.40	0.46	0.14	8
1.4 class members be culturally diverse	3.97	3.76	0.21	0.06	15
1.5 teachers pay attention to students, including showing appreciation and offering reinforcement to students.	4.10	3.51	0.59	0.17	6
2. Learning activities	3.93	3.40	0.53	0.16	1
2.1 learning activities focus on learning by doing	4.08	3.51	0.57	0.16	7
2.2 learning activities develop positive cultural relationships	3.94	3.34	0.60	0.18	5
2.3 teachers assign students to study out-of-class videos before doing in-class activities	3.67	3.38	0.29	0.09	12
2.4 learning activities start from problem-based learning and lead to problem solving actions	3.94	3.30	0.64	0.19	4
2.5 learning activities aim to involve all students in problem-solving by integrating students' existing experiences	3.95	3.27	0.68	0.21	2
2.6 learning activities focused on respect and understanding of students' cultural differences	3.97	3.42	0.55	0.16	7
2.7 learning activities focus on rationalisation considering rules and regulations, and making decision based on reliable resources	4.01	3.54	0.47	0.13	9
3. Cloud-based Learning context	4.02	3.65	0.37	0.10	4
3.1 technology applied in learning activities	4.13	3.82	0.31	0.08	13
3.2 ability to access online learning resources anywhere and anytime via electronic devices	4.14	3.75	0.39	0.10	11
3.3 ability to do collaborative work via the cloud	3.78	3.33	0.45	0.14	8
3.4 social network applications are used in learning activities	3.94	3.56	0.38	0.11	10
3.5 used in communication between students and teachers, as well as among students	4.10	3.80	0.30	0.08	13
4. Measurement and assessment	3.97	3.46	0.51	0.15	2
4.1 learning assessment is conducted weekly	3.80	3.12	0.68	0.22	1
4.2 assignments are relevant to lesson content	4.13	3.64	0.49	0.13	9
4.3 teachers to perform theory assessment	3.89	3.65	0.24	0.07	14
4.4 teachers perform practical assessments	4.01	3.55	0.46	0.13	9
4.5 students are involved in assessment	4.01	3.35	0.66	0.20	3

In summary, The analysis results of The actual state and expectations for the development of flipped classroom using problem-based learning in a multicultural society to enhance critical thinking of undergraduate students in public universities under the Office of the Higher Education Commission in the Central and Southern regions of Thailand via Priority Needs Index (PNI) with respect to the aspects of students and teachers, learning activities, cloud-based learning content, and measurement and assessment reveals the 5 most highly prioritized needs. The first is that learning assessment is conducted weekly ($PNI_{modified}$ = 0.22). The second is that that teachers perform pre-test assessment and learning activities aim to involve all students in problem solving analysis by integrating students' existing experiences ($PNI_{modified}$ = 0.21). The third is that students are involved in assessment ($PNI_{modified}$ = 0.20). The fourth is that learning activities start from problem-based learning and lead to problem solving actions ($PNI_{modified}$ = 0.19). The fifth is that learning activities develop positive cultural relationships ($PNI_{modified}$ = 0.18).

Conclusions and Discussion

This information represents the approach for developing learning activities that enable students to utilize cloud technology for learning via smart phone and using social media applications for learning activities, so that students can access information easily, anywhere and at anytime. The study of Badri, Nuaimi, Guang, and Rashedi (2017) shows that utilizing social media in school can affect student's cognition because students are eager to use social media for learning and it encourages student engagement in class. This is a modern, student-directed learning practice which is related to the research of Briz-Ponce, Pereira, Carvalho, Juanes-Méndez, and García-Peñalvo (2017), who found that social influence is an important factor for attitude and behavioral intent towards mobile learning. The ease in cognition and reliability of technology for learning are the main factors that may affect the behavioral intent. Furthermore, García-Álvarez, Novo-Corti, and Varela-Candamio (2018) state that social networks and the internet greatly influence the assessment of the virtual learning context of university students regarding knowledge access, improvement in learning efficiency and usefulness of contents and functions, and supplementing other learning ICT tools.

In terms of the actual state and expectations of the development of a flipped classroom using problem-based learning in a multicultural society to enhance critical thinking, regarding students and teachers. Rodríguez, Díaz, González, and González-Miquel (2018) state that reinforcement in learning is so important that teachers should involve it in learning activities because it helps stimulate students to be more interested in class, and it further motivates learners and promotes student engagement. The theory is in accord with Zainuddin's research (2018) about learning results and motivation from a gamified flipped classroom. It was found

that the cognition and achievement of students is improved by this type of learning model. Score marking and badges earned during learning activities are also very important to student reinforcement.

In terms of the actual state and expectations of the development of a flipped classroom using problem-based learning in a multicultural society to enhance critical thinking, regarding learning activities. Problem based learning is a learning tool which helps students enhance evidence-based knowledge and create linkage to practice. It helps develop skills in teamwork, research and assessment of ICT, as well as assessment in decision making. Students' knowledge acquisition can be achieved through problem solving, and investigation of evidence and reliable resources, leading to effective solutions (Cartwright, 2018; Rojana Phungsuk., Chantana Viriyavejakul, & Thanin Ratanaolarn, 2017).

In terms of the actual state and expectations of the development of flipped classroom using problem based learning in multicultural society to enhance critical, regarding cloud-based learning context. Al-Samarraie and Saeed's 2018 research found that applying cloud computing tools in university students' collaborative works is used mostly for developing students' reflection and idea generation abilities, and promoting students' active discussion, sharing, and editing of learning resources. Moreover, the ability to access learning resources anywhere and at anytime via smart phones effectively provides more opportunities and expands learning activities outside classroom (Crompton & Burke, 2018).

In terms of the actual state and expectations of the development of flipped classroom using problem based learning in multicultural society to enhance critical, regarding measurement and assessment. The result is relevant to the research of Kippers, Wolterinck, Schildkamp, Poortman, and Visscher (2018) regarding the learning assessment for f 5-25 year-old students in classroom activities. The research found that asking questions or classroom discussions enables teachers to gain insightful information about students' prior knowledge, understanding of learning content, and problems encountered in learning. Teachers can regularly provide different types of feedback to students during class as it helps improve students' learning. On the contrary, teachers should not use self-assessment very often because it produces inconsistent assessment results, as students do not understand the rationale of the assessment, no advice nor suggestions are given, and students are not aware of, and do not pay attention to the assessment.

Recommendations

1. Therefore, Instructors or instructional designers can apply these results to develop and design of online learning in the classroom, or the Massive Open Online Courseware (MOOC) in other contexts.

2. It could be suggested that to study and explore the cloud-based flipped classroom by using both qualitative and quantitative data. The survey sample consisted of both learners and instructors in order to obtain in-depth information that can be applied to develop learning even more.

3. The data used in this research was collected from undergraduate students in public universities under the Office of the Higher Education Commission in Central and Southern regions of Thailand in order to develop an assessment regarding a multicultural society context. Further research about priority needs should be conducted, especially in a target sample group in which the consequential action from this research is able to be implemented.

4. More research about the state and needs for the development of a flipped classroom using problem-based learning in a multicultural society to enhance critical thinking should be conducted to improve the learning skills of 21st century students.

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